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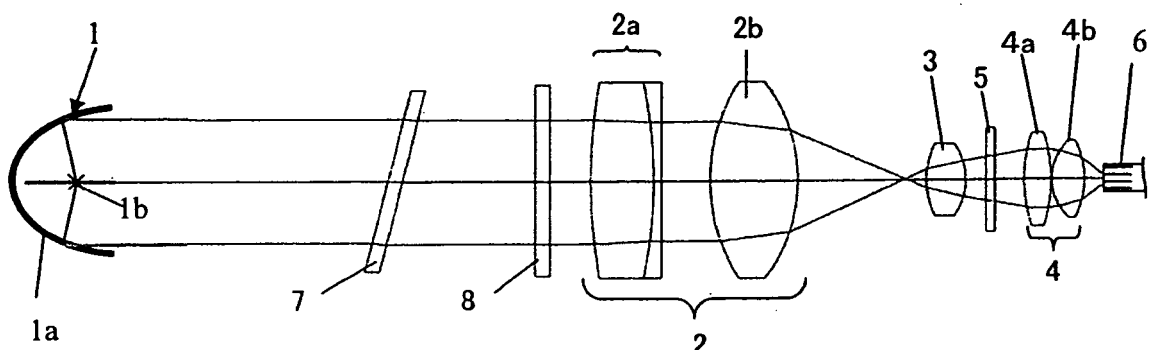
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(54) **Light source optical system**

(57) The invention relates to a light source optical system for endoscopes which is compatible with various viewing modes, prevents an associated light source apparatus from growing bulky, and makes sure brightness. The light source optical system comprises, in order from the light source 1, the collective optical system 2 for collecting light from the light source, the magnification conversion optical system 3 for reducing a pupil magnifica-

tion, and the positive lens group 4 for collecting light from the magnification conversion optical system 3, and satisfies Condition (1) with respect to the principal point-to-point distance d of the collective optical system 2 and magnification conversion optical system 3, the rear focal length f_{2B} of the collective optical system 2 and the front focal length f_{3F} of the magnification conversion optical system 3.

FIG. 1





EUROPEAN SEARCH REPORT

Application Number
EP 09 00 7896

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 5 993 037 A (TOMIOKA MAKOTO [JP] ET AL) 30 November 1999 (1999-11-30) * column 13, line 35 - column 15, line 23; figures 11,12; example 4 * -----	1-7	INV. G02B23/24
A	US 5 143 435 A (KIKUCHI AKIRA [JP]) 1 September 1992 (1992-09-01) * the whole document * -----	1-7	
A	JP 1 144009 A (OLYMPUS OPTICAL CO) 6 June 1989 (1989-06-06) * the whole document * -----	1-7	
A	JP 62 040416 A (OLYMPUS OPTICAL CO) 21 February 1987 (1987-02-21) * the whole document * -----	1-7	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			G02B
Place of search		Date of completion of the search	Examiner
Berlin		25 August 2010	Andreassen, Jon
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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Application Number

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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☒ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



**LACK OF UNITY OF INVENTION
SHEET B**

Application Number

EP 09 00 7896

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-3

The light source optical system further comprising in order from a light source:

a collective optical system for collecting light from the light source;

a magnification conversion optical system for reducing a pupil magnification; and

a positive lens group for collecting light from said magnification conversion optical system, satisfying the following condition (1):

$$d < f2B + f3F < d + f3F$$

where d is a principal point-to-point distance of said collective optical system and said magnification conversion optical system, f2B is a rear focal length of said collective optical system, and f3F is a front focal length of said magnification optical system [claim 1].

2. claims: 4, 6, 7

The light source optical system further comprising in order from a light source side:

a collective optical system for collecting light from the light source;

a magnification conversion optical system for reducing a pupil magnification; and

a positive lens group for collecting light from said magnification conversion optical system,

wherein an achromatic lens is located between said light source and said collective optical system [claim 4].

3. claim: 5

The light source optical system wherein a reflection type infrared cut filter and an absorption type infrared cut filter are interposed between the light source and the collective optical system,

wherein the reflection type infrared cut filter satisfies the following condition (4), and said absorption type infrared cut filter is located with a filter surface lying in a direction vertical to an optical axis:

$$\Theta = \tan^{-1} (D/2L) \quad (4)$$

where Θ is a angle of the reflection type infrared cut filter with the direction vertical to the optical axis, D is a pupil diameter of the light source lamp that forms the light source, and L is a distance from a pupil position of the light source lamp up to a surface of the reflection type infrared cut filter [claim 5].



**LACK OF UNITY OF INVENTION
SHEET B**

Application Number
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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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25-08-2010

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US 5993037	A	30-11-1999	US	6086531 A	11-07-2000
US 5143435	A	01-09-1992	JP	3118509 A	21-05-1991
JP 1144009	A	06-06-1989	JP	2826315 B2	18-11-1998
JP 62040416	A	21-02-1987	JP	1993069 C	22-11-1995
			JP	6025827 B	06-04-1994
